Class 9 Math’s Formula

CBSE Class 9 Math’s Summary

This pdf list all the Class 9 CBSE math’s formula in a concise manner to help the students in revision and examination as per NCERT syllabus

Number system

S.no	Type of Numbers	Description
1	Natural Numbers	N = {1,2,3,4,5………} It is the counting numbers
2	Whole number	W= {0,1,2,3,4,5……..} It is the counting numbers + zero
3	Integers	Z={…-7,-6,-5,-4,-3,-2,-1,0,1,2,3,4,5,6…}
4	Positive integers	Z_+= {1,2,3,4,5……..}
5	Negative integers	Z_-={…-7,-6,-5,-4,-3,-2,-1}
6	Rational Number	A number is called rational if it can be expressed in the form p/q where p and q are integers (q> 0). Example : ½ , 4/3 ,5/7 ,1 etc.
7	Irrational Number	A number is called rational if it cannot be expressed in the form p/q where p and q are integers (q> 0). Example : $\sqrt{3}, \sqrt{2}, \sqrt{5}, \pi$ etc
8.	Real Numbers:	All rational and all irrational number makes the collection of real number. It is denoted by the letter R
9	What is zero	Zero number definition Zero is a number used in mathematics to describe no quantity or null quantity.It is also used as placeholder digit in many numbers The modern 0 symbol was invented in India in the 6-th century, used later by the Persians and

Arabs and later in Europe.

Important facts about zero

1) Zero is a number but it is neither positive nor negative number.

So it is not included in the set of positive number nor negative numbers.

But it is included in the set of non-negative numbers

2) Zero is an even number

3) Zero is not a prime nor a composite number. It cannot be prime because it has an infinite number of factors and cannot be composite

because it cannot be expressed by multiplying prime numbers (0 must always be one of the factors)

Law of exponents

1) $a^p.a^q = a^{p+q}$
2) $\frac{a^p}{a^q} = a^{p-q}$
3) $(a^p)^q = a^{pq}$
4) $a^p.b^p = ab^p$
5) $a^{-p} = \frac{1}{a^p}$
6) $a^0=1$
7) $a^1=a$

Polynomial expressions

A polynomial expression S(x) in one variable x is an algebraic expression in x term as

$$S(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \cdots \ldots \ldots \ldots + ax + a_0$$

Where $a_n, a_{n-1}, \ldots, a, a_0$ are constant and real numbers and a_n is not equal to zero

Some Important point to Note

S.no	Points
1	$a_n, a_{n-1}, a_{n-2}, \ldots\ldots a_1, a_0$ are called the coefficients for $x^n, x^{n-1}, \ldots\ldots x^1, x^0$
2	n is called the degree of the polynomial
3	when $a_n, a_{n-1}, a_{n-2}, \ldots\ldots a_1, a_0$ all are zero, it is called zero polynomial
4	A constant polynomial is the polynomial with zero degree, it is a constant value polynomial
5	A polynomial of one item is called monomial, two items binomial and three items as trinomial
6	A polynomial of one degree is called linear polynomial, two degree as quadratic polynomial and degree three as cubic polynomial

Important concepts on Polynomial

Concept	Description
Zero's or roots of the polynomial	It is a solution to the polynomial equation S(x)=0 i.e. a number "a" is said to be a zero of a polynomial if S(a) = 0. If we draw the graph of S(x) =0, the values where the curve cuts the X-axis are called Zeros of the polynomial
Remainder Theorem's	If p(x) is an polynomial of degree greater than or equal to 1 and p(x) is divided by the expression (x-a),then the remainder will be p(a)
Factor's Theorem's	If x-a is a factor of polynomial p(x) then p(a)=0 or if p(a) =0,x-a is the factor the polynomial p(x)

COORDINATE GEOMETRY

S.no	Points
1	We require two perpendicular axes to locate a point in the plane. One of them is horizontal and other is Vertical
2	The plane is called Cartesian plane and axis are called the coordinates axis
3	The horizontal axis is called x-axis and Vertical axis is called Y-axis
4	The point of intersection of axis is called origin.
5	The distance of a point from y axis is called x –coordinate or abscissa and the distance of the point from x –axis is called y – coordinate or Ordinate
6	The distance of a point from y axis is called x –coordinate or abscissa and

	the distance of the point from x –axis is called y – coordinate or Ordinate
7	The Origin has zero distance from both x-axis and y-axis so that its abscissa and ordinate both are zero. So the coordinate of the origin is (0, 0)
8	A point on the x –axis has zero distance from x-axis so coordinate of any point on the x-axis will be (x, 0)
9	A point on the y –axis has zero distance from y-axis so coordinate of any point on the y-axis will be (0, y)
10	The axes divide the Cartesian plane in to four parts. These Four parts are called the quadrants

The coordinates of the points in the four quadrants will have sign according to the below table

Quadrant	x-coordinate	y-coordinate
Ist Quadrant	+	+
IInd quadrant	-	+
IIIrd quadrant	-	-
IVth quadrant	+	-

LINEAR EQUATIONS IN TWO VARIABLES

An equation of the form ax + by + c = 0, where a, b and c are real numbers, such that a and
b are not both zero, is called a linear equation in two variables
Important points to Note

S.no	Points
1	A linear equation in two variable has infinite solutions
2	The graph of every linear equation in two variable is a straight line
3	x = 0 is the equation of the y-axis and y = 0 is the equation of the x-axis
4	The graph x=a is a line parallel to y -axis.
5	The graph y=b is a line parallel to x -axis
6	An equation of the type y = mx represents a line passing through the origin.
7	Every point on the graph of a linear equation in two variables is a solution of the linear equation. Moreover, every solution of the linear equation is a point on the graph

Euclid Geometry

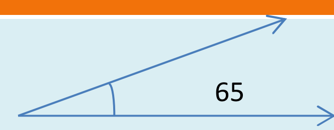
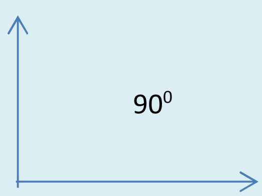
S.no	Terms	Descriptions
1	**Euclid**	Euclid a Greek mathematician is called the Father of Geometry
2	**Euclid Geometry definition**	1) A point is that which has no part 2) A line is breath less and has length only 3) The end of a line is points 4) A straight line is a line which lies evenly with the points on itself 5) A surface is that which has length and breadth only 6) The edges of a surface are lines The definitions of line, point, plane explained by Euclid is not accepted by the Mathematician. So these terms are taken as undefined
3	Axioms or Postulates	Axioms or Postulates are assumptions which are obvious universal truths. They are not proved
4	Theorems	They are statements which are proved using axioms/postulates, definition, previously proved statement and deductive reasoning
5	Euclid Axioms	1) Things which are equal to same things are equal to one another If x=z, y=z then x=y 2) If equals are added to equals, the wholes are equal x=y => x+z=y+z 3) If equals are subtracted from equals, the remainders are equal X=y => x-z=y-z 4) Things which coincide with one another are equal to one another

		5) The whole is greater than the part 6) Things which are double of the same things are equal to one another 7) Things which are halves of the same things are equal to one another 8) If first thing is greater than second and second is greater than third, then first is greater than third
6	Euclid Postulates	1) A straight line may be drawn from one point to another point 2) A terminated line can be produced indefinitely 3) A circle can be drawn with any center and any radius 4) All right angles are equal to one another 5) If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the straight lines if produced indefinitely meet on that side on which the angles are less than the two right angles
7	Playfair Axiom	For every line l and for every point P not lying on the line l, there exists a unique line m passing through P and Parallel to l

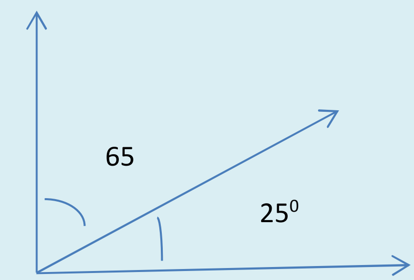
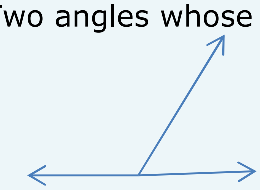
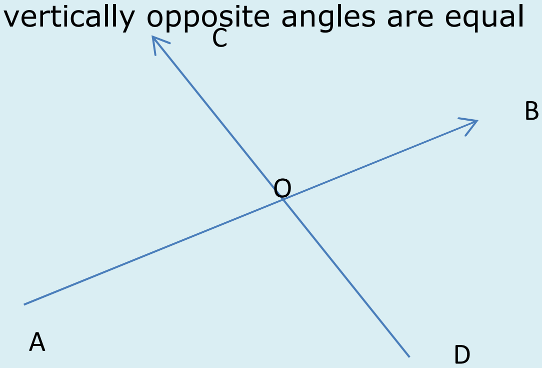
Line and Angles

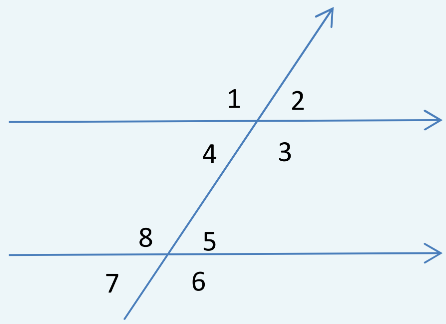
What is angle: An angle is a formed of two rays with a common endpoint. The Common end point is known as the vertex of the angle and the rays as the sides, sometimes as the legs and sometimes the arms of the angle

Types Of angles

Angle Type	**Figure**
Acute Angle **0< θ < 90**	
Obtuse Angle **90< θ < 180**	
Right Angle **θ =90**	
Reflex Angle **180< θ < 360**	
Straight Angle	

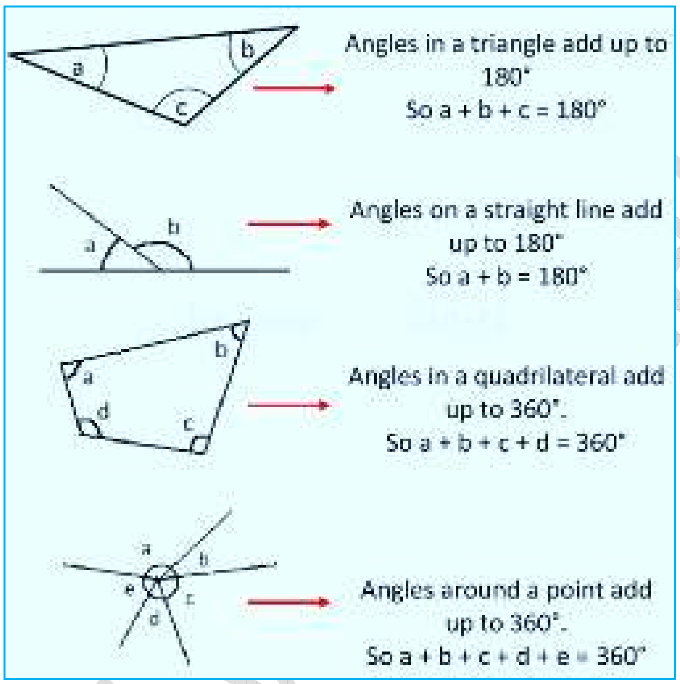
θ =180

S.no	Terms	Descriptions
1	Complimentary Angles	Two angles whose sum equal to 90^0 
2	Supplementary Angles	Two angles whose sum equal to 180^0 
3	Vertically Opposite angles	If two lines intersect with each other, then vertically opposite angles are equal 

		$\angle AOC = \angle BOD$
4	Transversal across the parallel Lines	If the transversal intersect two parallel lines  a) Each pair of corressponding angles are equals $\angle 1 = \angle 8 \quad \angle 2 = \angle 5 \quad \angle 4 = \angle 7 \quad \angle 3 = \angle 6$ b) Each pair of alternate interior angles are equal $\angle 3 = \angle 8 \quad \angle 4 = \angle 5$ c) Each pair of interior angles on the same side of the transversal is supplimentary $\angle 4 + \angle 8 = 180 \quad \angle 3 + \angle 5 = 180$
5	Theorem on Transversal across the lines	If a transversal intersect two lines such that either a) any one pair of corresponding angles are equal b) any one pair of alternate interior angles are equal c) any one pair of interior angles on the same side of the transversal is supplimentary Then the two lines are parallel

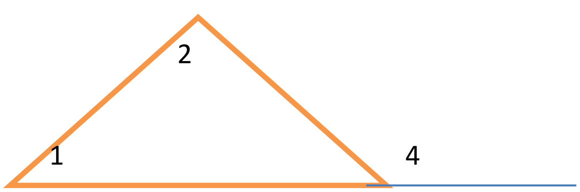
6	Parallel lines Note	Lines which are parallel to a given line are parallel with each other

Angles rules

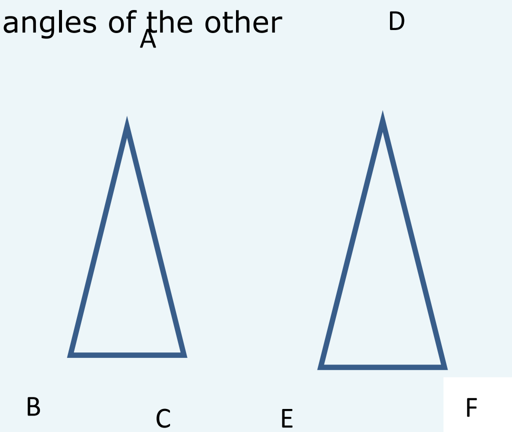


if the side of the triangle is produced ,the exterior angle formed is equal to the sum of the opposite interior angle

$\angle 4 = \angle 1 + \angle 2$

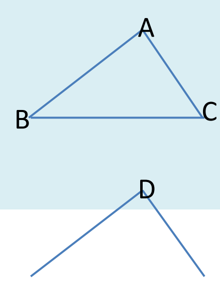


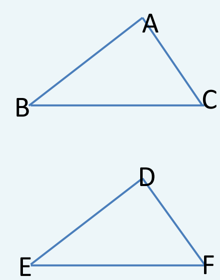
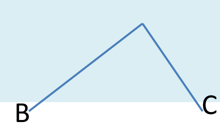
Triangles

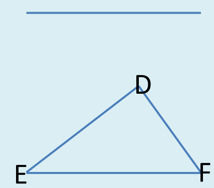
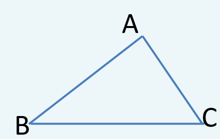
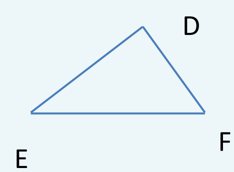
S.no	Terms	Descriptions
1	Congruence	Two Geometric figure are said to be congruence if they are exactly same size and shape Symbol used is $\cong$ Two angles are congruent if they are equal Two circle are congruent if they have equal radii Two squares are congruent if the sides are equal
2	Triangle Congruence	• Two triangles are congruent if three sides and three angles of one triangle is congruent to the corresponding sides and angles of the other  • Corresponding sides are equal AB=DE , BC=EF ,AC=DF • Corresponding angles are equal $\angle A = \angle D, \angle B = \angle E, \angle C = \angle F$ • We write this as

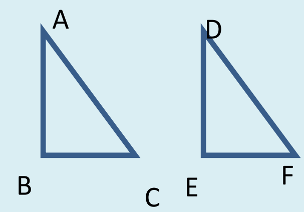
		$ABC \cong DEF$ • The above six equalities are between the corresponding parts of the two congruent triangles. In short form this is called **C.P.C.T** • We should keep the letters in correct order on both sides
3	Inequalities in Triangles	1) In a triangle angle opposite to longer side is larger 2) In a triangle side opposite to larger angle is larger 3) The sum of any two sides of the triangle is greater than the third side In triangle ABC AB +BC > AC

Different Criterion for Congruence of the triangles

N	Criterion	Description	Figures and expression
1	Side angle Side (SAS) congruence	• Two triangles are congruent if the two sides and included angles of one triangle is equal to the two sides and included angle • It is an axiom as it cannot be	

	proved so it is an accepted truth • ASS and SSA type two triangles may not be congruent always	 **If following condition** **AB=DE, BC=EF** $\angle B = \angle E$ **Then** $ABC \cong DEF$
2 Angle side angle (ASA) congruence	• Two triangles are congruent if the two angles and included side of one triangle is equal to the corresponding angles and side • It is a theorem and can be proved	 **If following condition** **BC=EF** $\angle B = \angle E, \angle C = \angle F$ **Then** $ABC \cong DEF$
3 Angle angle side(AAS) congruence	• Two triangles are congruent if the any two pair of angles and any side of one triangle is equal to the	

		corresponding angles and side • It is a theorem and can be proved	 **If following condition** **BC=EF** $\angle A = \angle D, \angle C = \angle F$ **Then** $ABC \cong DEF$
4	Side-Side-Side (SSS) congruence	• Two triangles are congruent if the three sides of one triangle is equal to the three sides of the another	  **If following condition** **BC=EF,AB=DE,DF =AC** **Then** $ABC \cong DEF$

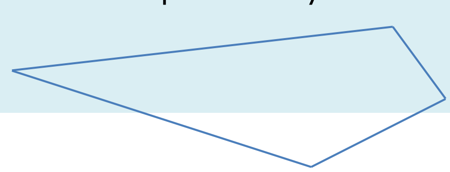
5	Right angle – hypotenuse-side(RHS) congruence	• Two right triangles are congruent if the hypotenuse and a side of the one triangle are equal to corresponding hypotenuse and side of the another	 **If following condition** **AC=DF,BC=EF** **Then** $ABC \cong DEF$

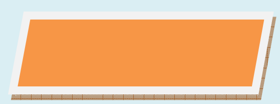
Some Important points on Triangles

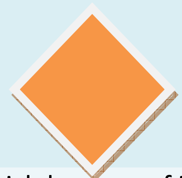
Terms	**Description**
Orthocenter	Point of intersection of the three altitude of the triangle
Equilateral	triangle whose all sides are equal and all angles are equal to 60^0
Median	A line Segment joining the corner of the triangle to the midpoint of the opposite side of the triangle
Altitude	A line Segment from the corner of the triangle and perpendicular to the opposite side of the triangle
Isosceles	A triangle whose two sides are equal
Centroid	Point of intersection of the three median of the triangle is called the centroid of

	the triangle
In center	All the angle bisector of the triangle passes through same point
Circumcenter	The perpendicular bisector of the sides of the triangles passes through same point
Scalene triangle	Triangle having no equal angles and no equal sides
Right Triangle	Right triangle has one angle equal to 90^0
Obtuse Triangle	One angle is obtuse angle while other two are acute angles
Acute Triangle	All the angles are acute

Quadrilaterals

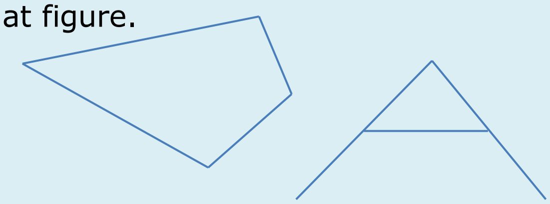
S.no	Terms	Descriptions
1	Quadrilateral	A quadrilateral is the union of four line-segments determined by four distinct coplanar points of which no three are collinear and the line-segments intersect only at end points. For ABCD to be quadrilateral, following condition are required a) The four points A, B, C and D must be distinct and co-planar. b) No three of points A, B, C and D are co-linear. c) Line segments i.e. AB, BC, CD, DA intersect at their end points only. 

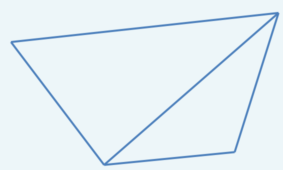
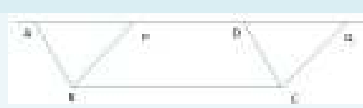
		A quadrilateral is a four-sided polygon with four angles. There are many kinds of quadrilaterals. The five most common types are the parallelogram, the rectangle, the square, the trapezoid, and the rhombus.
2	Angle Property of Quadrilateral	1) Sum of all the interior angles is 360^0 2) Sum of all the exterior angles is 360^0
3	Parallelogram	A quadrilateral which has both pairs of opposite sides parallel is called a parallelogram. Its properties are: • The opposite sides of a parallelogram are equal. • The opposite angles of a parallelogram are equal. • The diagonals of a parallelogram bisect each other. • The diagonal of a parallelogram divide into two congruent triangles  A quadrilateral is said to a parallelogram if Opposite sides are equal **OR** Opposite angles are equal **OR** Diagonal bisects each other **OR** A pair of opposite are parallel and equal
4	Trapezium	A quadrilateral which has one pair of opposite sides parallel is called a trapezium. 
5	Rhombus	Rhombus is a parallelogram in which any pair of adjacent sides is equal.

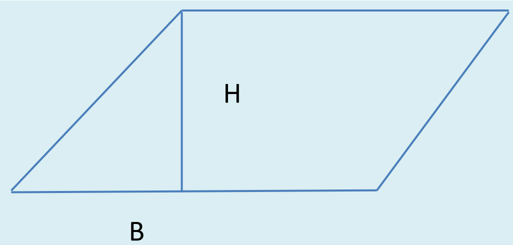
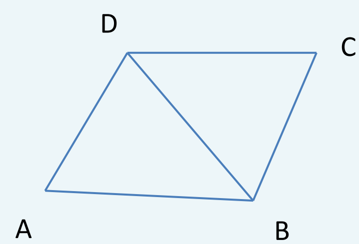
		Properties of a rhombus: • All sides of a rhombus are equal • The opposite angles of a rhombus are equal • The diagonals of a rhombus bisect each other at right angles. 
6	Rectangles	A parallelogram which has one of its angles a right angle is called a rectangle. Properties of a rectangle are: • The opposite sides of a rectangle are equal • Each angle of a rectangle is a right-angle. • The diagonals of a rectangle are equal. • The diagonals of a rectangle bisect each other. 
7	Square	A quadrilateral, all of whose sides are equal and all of whose angles are right angles.  Properties of square are: • All the sides of a square are equal. • Each of the angles measures 90°. • The diagonals of a square bisect each other at right angles. The diagonals of a square are equal.
8	Important points about quadrilaterals	a) A square is always a parallelogram. b) A square is always a rectangle. c) A rhombus can be square. e) A rectangle has four right angles.
9	Mid-point Theorems for Triangles	1)The line segment joining the mid points of the two sides of the triangle is parallel to the third side

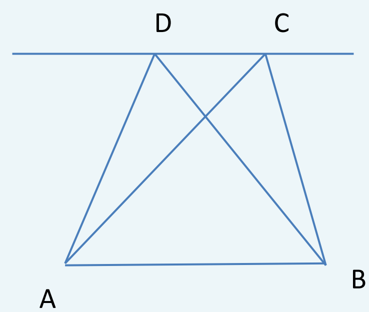
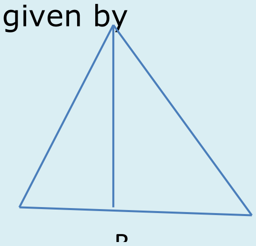
		2) A line drawn through mid-point of one side of a triangle and parallel to another side bisect the third side of the triangle

Area of Parallelogram

S.no	Terms	Descriptions
1	Area of figure	Area of a figure is a number (in some unit) associated with the part of the plane enclosed by that figure. 
2	Properties of Area	(1) Two congruent figures have same area  2) If two figure have same area, they are not necessary congruent 

		3) If a planar region formed by a figure T is made up of two non-overlapping planar regions Formed by figures P and Q, then ar (T) = ar (P) + ar (Q), where ar (X) denotes the area of Figure X. 
3	Figure on the same base and between same parallels	Two figures are said to be on the same base and between the same parallels, if they have a common base (side) and the vertices, (or the vertex) opposite to the common base of each figure lies on a line parallel to the base.  In the above figure triangle and parallelogram are on the same base and between same parallel
4	Parallelogram on same base and between same parallel	 Parallelograms on the same base (or equal bases) and between the same parallels are equal in area. **Area of Parallelogram ABCD= Area of Parallelogram PBCQ**
5	Area of Parallelogram	Area of parallelogram is equal base multiplied by Height

		 **Area of Parallelogram =Height X Base** Parallelograms on the same base (or equal bases) and having equal areas lie between the same parallel
6	Triangles and Parallelogram	a) If a parallelogram and a triangle are on the same base and between the same parallels, then area of the triangle is half the area of parallelogram  **Area of triangle ADB= $\frac{1}{2}$ X Area of parallelogram ABCD** b) Triangles on the same base (or equal bases) and between the same parallels are equal in area

		 **Area of triangle ABD=Area of triangle ACB**
7	Area of Triangle	1) Area of triangle is given by $A = \frac{1}{2} BXH$  2) Triangles on the same base (or equal bases) and having equal areas lie between the same parallels

Circles

S.no	Points
1	A circle is a collection of all the points in a plane, which are equidistant from a fixed point in the plane

2	Equal chords of a circle (or of congruent circles) subtend equal angles at the center.
3	If the angles subtended by two chords of a circle (or of congruent circles) at the center (corresponding center) are equal, the chords are equal.
4	The perpendicular from the center of a circle to a chord bisects the chord.
5	The line drawn through the center of a circle to bisect a chord is perpendicular to the chord.
6	There is one and only one circle passing through three non-collinear points
7	Equal chords of a circle (or of congruent circles) are equidistant from the center (or corresponding centers).
8	Chords equidistant from the center (or corresponding centers) of a circle (or of congruent circles) are equal
9	If two arcs of a circle are congruent, then their corresponding chords are equal and conversely, if two chords of a circle are equal, then their corresponding arcs (minor, major) are congruent.
10	Congruent arcs of a circle subtend equal angles at the center.
11	The angle subtended by an arc at the center is double the angle subtended by it at any point on the remaining part of the circle
12	Angles in the same segment of a circle are equal
13	Angle in a semicircle is a right angle.
14	If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the line segment, the four points lie on a circle.
15	The sum of either pair of opposite angles of a cyclic quadrilateral is 180°.
16	If the sum of a pair of opposite angles of a quadrilateral is 180°, then the

quadrilateral is cyclic.

Heron Formula

S.no	Term	Description
1	Mensuration	It is branch of mathematics which is concerned about the measurement of length ,area and Volume of plane and Solid figure
2	Perimeter	a)The perimeter of plane figure is defined as the length of the boundary b)It units is same as that of length i.e. m ,cm,km
3	Area	a)The area of the plane figure is the surface enclosed by its boundary b) It unit is square of length unit. i.e. m^2 , km^2

Unit Conversion

1 Meter	**10 Decimeter**	**100 centimeter**
1 Decimeter	10 centimeter	100 millimeter
1 Km	10 Hectometer	100 Decameter
1 Decameter	10 meter	1000 centimeter

1 square Meter	**100 square Decimeter**	**10000 square centimeter**

1 square Decimeter	100 square centimeter	10000 square millimeter
1 Hectare	100 square Decameter	10000 square meter
1 square myraimeter	100 square kilometer	10^8 square meter

Perimeter and Area of Different Figure

N	Shape	Perimeter/height	Area
1	Right angle triangle Base =b, Height =h Hypotenuse=d	P=b+h+d Height =h	$A = \frac{1}{2}bh$
2	Isosceles right angled triangle Equal side =a	$p = 2a + a\sqrt{2}$ Height=a	$A = \frac{1}{2}a^2$
3	Any triangle of sides a,b ,c	P=a+b+c	$A = \sqrt{s(s-a)(s-b)(s-c)}$ Where $s = \frac{a+b+c}{2}$ This is called Heron's formula (sometimes called Hero's formula) is named after Hero of Alexandria
4	Square	P=4a	**$A=a^2$**

	Side =a		
5	Rectangle of Length and breadth L and B respectively	P=2L +2B	A=LX B
6	Parallelograms Two sides are given as a and b	P=2a+2b	A= BaseX height When the diagonal is also given ,say d Then $A = 2\sqrt{s(s-a)(s-b)(s-d)}$ Where $s = \frac{a+b+d}{2}$
7	Rhombus Diagonal d_1 and d_2 are given	$p = 2\sqrt{d_1^2 + d_2^2}$ $side = \frac{1}{2}\sqrt{d_1^2 + d_2^2}$	$A = \frac{1}{2}d_1d_2$
8	Quadrilateral a) All the sides are given a,b,c ,d b) Both the diagonal are perpendicular to each other	a) P=a+b+c+d	a) $A = \sqrt{(s-a)(s-b)(s-c)(s-d)}$ where $s = \frac{a+b+c+d}{2}$ b) $A = \frac{1}{2}d_1d_2$ where d_1 and d_2 are the diagonal

c) When a diagonal and perpendicular to diagonal are given	c) $A = \frac{1}{2} d (h_1 + h_2)$ where d is diagonal and h_1 and h_2 are perpendicular to that

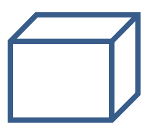
Surface Area and Volume

S.no	Term	Description
1	Mensuration	It is branch of mathematics which is concerned about the measurement of length ,area and Volume of plane and Solid figure
2	Perimeter	a)The perimeter of plane figure is defined as the length of the boundary b)It units is same as that of length i.e. m ,cm,km
3	Area	a)The area of the plane figure is the surface enclosed by its boundary b) It unit is square of length unit. i.e. m^2 , km^2
4	Volume	Volume is the measure of the amount of space inside of a solid figure, like a cube, ball, cylinder or pyramid. Its units are always "cubic", that is, the number of little element cubes that fit inside the figure.

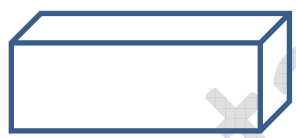
Volume Unit conversion

1 cm^3	**1mL**	**1000 mm^3**
1 Litre	1000ml	1000 cm^3
1 m^3	10^6 cm^3	1000 L
1 dm^3	1000 cm^3	1 L

Surface Area and Volume of Cube and Cuboid



Cube

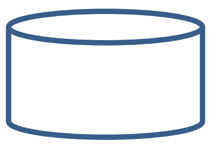


Cuboid

Type	Measurement
Surface Area of Cuboid of Length L, Breadth B and Height H	2(LB + BH + LH).
Lateral surface area of the cuboids	2(L + B) H
Diagonal of the cuboids	$\sqrt{L^2+B^2+H^2}$
Volume of a cuboids	LBH
Length of all 12 edges of the cuboids	4 (L+B+H).

Surface Area of Cube of side L	$6L^2$
Lateral surface area of the cube	$4L^2$
Diagonal of the cube	$L\sqrt{3}$
Volume of a cube	L^3

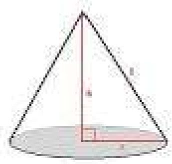
Surface Area and Volume of Right circular cylinder



Radius	**The radius (r) of the circular base is called the radius of the cylinder**
Height	The length of the axis of the cylinder is called the height (h) of the cylinder
Lateral Surface	The curved surface joining the two base of a right circular cylinder is called Lateral Surface.

Type	Measurement
Curved or lateral Surface Area of cylinder	$2\pi rh$
Total surface area of cylinder	$2\pi r(h+r)$
Volume of Cylinder	πr^2h

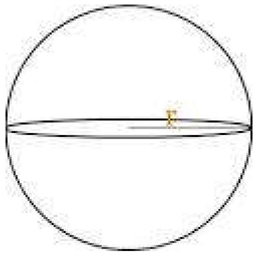
Surface Area and Volume of Right circular cone



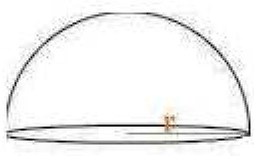
Radius	**The radius (r) of the circular base is called the radius of the cone**
Height	The length of the line segment joining the vertex to the center of base is called the height (h) of the cone.
Slant Height	The length of the segment joining the vertex to any point on the circular edge of the base is called the slant height (L) of the cone.
Lateral surface Area	The curved surface joining the base and uppermost point of a right circular cone is called Lateral Surface

Type	Measurement
Curved or lateral Surface Area of cone	πrL
Total surface area of cone	$\pi r(L+r)$
Volume of Cone	$\frac{1}{3}\pi r^2 h$

Surface Area and Volume of sphere and hemisphere



Sphere

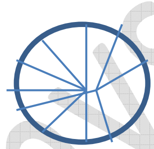


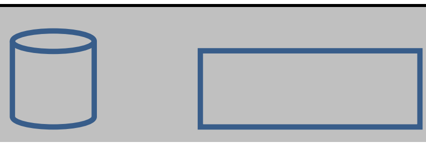
Hemisphere

Sphere	**A sphere can also be considered as a solid obtained on rotating a circle About its diameter**
Hemisphere	A plane through the centre of the sphere divides the sphere into two equal parts, each of which is called a hemisphere
radius	The radius of the circle by which it is formed
Spherical Shell	The difference of two solid concentric spheres is called a spherical shell
Lateral Surface Area for Sphere	Total surface area of the sphere
Lateral Surface area of Hemisphere	It is the curved surface area leaving the circular base

Type	Measurement
Surface area of Sphere	$4\pi r^2$
Volume of Sphere	$\frac{4}{3}\pi r^3$
Curved Surface area of hemisphere	$2\pi r^2$
Total Surface area of hemisphere	$3\pi r^2$
Volume of hemisphere	$\frac{2}{3}\pi r^3$
Volume of the spherical shell whose outer and inner radii and 'R' and 'r' respectively	$\frac{4}{3}\pi(R^3 - r^3)$

How the Surface area and Volume are determined

Area of Circle 	**The circumference of a circle is 2πr. This is the definition of π (pi). Divide the circle into many triangular segments. The area of the triangles is 1/2 times the sum of their bases, 2πr (the circumference), times their height, r.** $A = \frac{1}{2} 2\pi r r = \pi r^2$
Surface Area of cylinder	This can be imagined as unwrapping the surface into a rectangle.

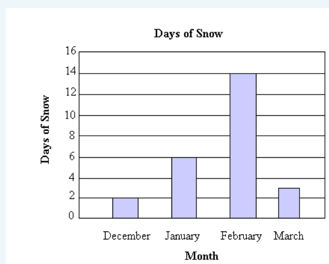
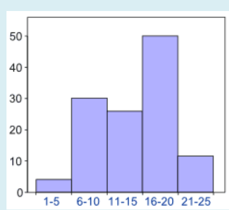


Surface area of cone	This can be achieved by divide the surface of the cone into its triangles, or the surface of the cone into many thin triangles. The area of the triangles is 1/2 times the sum of their bases, p, times their height, $A = \frac{1}{2} 2\pi r s = \pi r s$

Statistics

S.no	Term	Description
1	Statistics	Statistics is a broad mathematical discipline which studies ways to collect, summarize, and draw conclusions from data
2	Data	A systematic record of facts or different values of a quantity is called **data**. Data is of two types - Primary data and Secondary data. **Primary Data**: The data collected by a researcher with a specific purpose in mind is called primary data.

		Secondary Data: The data gathered from a source where it already exists is called secondary data
3	Features of data	• Statistics deals with collection, presentation, analysis and interpretation of numerical data. • Arranging data in an order to study their salient features is called presentation of data. • Data arranged in ascending or descending order is called arrayed data or an array • **Range** of the data is the difference between the maximum and the minimum values of the observations • Table that shows the frequency of different values in the given data is called a **frequency distribution table** • A frequency distribution table that shows the frequency of each individual value in the given data is called an ungrouped frequency distribution table. • A table that shows the frequency of groups of values in the given data is called a grouped frequency distribution table • The groupings used to group the values in given data are called classes or class-intervals. The number of values that each class contains is called the class size or class width. The lower value in a class is called the lower class limit. The higher value in a class is called the upper class limit. • **Class mark** of a class is the mid value of the two limits of that class. • A frequency distribution in which the upper limit of one class differs from the lower limit of the succeeding class is called an **Inclusive or discontinuous Frequency Distribution**. • A frequency distribution in which the upper

		limit of one class coincides from the lower limit of the succeeding class is called an **exclusive or continuous Frequency Distribution** • .
4	Bar graph	A bar graph is a pictorial representation of data in which rectangular bars of uniform width are drawn with equal spacing between them on one axis, usually the x axis. The value of the variable is shown on the other axis that is the y axis. 
5	Histogram	A histogram is a set of adjacent rectangles whose areas are proportional to the frequencies of a given continuous frequency distribution 
6	Mean	The mean value of a variable is defined as the sum of all the values of the variable divided by the number of values. $a_m = \frac{a_1 + a_2 + a_3 + a_4}{4} = \frac{\sum_0^n a}{n}$
7	Median	The **median** of a set of data values is the middle value of the data set when it has been arranged in ascending order. That is, from the smallest value to the highest value

		Median is calculated as $\frac{1}{2}(n+1)$ Where n is the number of values in the data If the number of values in the data set is even, then the **median** is the average of the two middle values.
8	Mode	Mode of a statistical data is the value of that variable which has the maximum frequency

Probability

S.no	Term	Description
1	***Empirical probability***	It is a probability of event which is calculated based on experiments $\textit{Emprical Probability} = \frac{\textit{No of trails which expected outcome}}{\textit{Total Number of trials}}$ ***Example:*** A coin is tossed 1000 times; we get 499 times head and 501 times tail, So empirical or experimental probability of getting head is calculated as

		$p = \frac{499}{1000} = .499$ ***Empirical probability depends on experiment and different will get different values based on the experiment***
2	Important point about events	If the event A, B, C covers the entire possible outcome in the experiment. Then, **P (A) +P (B) +P(C) =1**
3	**impossible event**	The probability of an event (U) which is impossible to occur is 0. Such an event is called an **impossible event** **P (U)=0**
4	Sure or certain event	The probability of an event (X) which is sure (or certain) to occur is 1. Such an event is called a **sure event or a certain event** **P(X) =1**
5	Probability of any event	Probability of any event can be as $0 \le P(E) \le 1$